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Radio tracking helps ministry researchers study the transmission of rabies in red foxes, skunks, raccoons and coyotes. It also tells them that polar bears travel hundreds of kilometres in Arctic seas. These and other types of remote sensing benefits are explained by Dr. David Fraser, wildlife research specialist.

It takes plenty of nerve to be a conservation officer. The account by Ken Evans about confronting deer poachers on a cold winter night close to Minesing Swamp, reads like an adventure thriller.

Gerry Harris talks about the mystery cat reported to be roaming the Owen Sound District, Ed Addison describes different kinds of animal ticks, Harold Jenkins explains what it's like to have bats in the belfry and Dan Strickland has the latest news on Algonquin's peregrine falcons.

Front cover—Close-up of a saw-whet owl. Photo by Erika Thimm.

Outside back cover—Gerry Harris preparing plaster casts of animal tracks. Photo by R. Gray.

Inside back cover—A close view of the magnificent peregrine falcon.

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The goal of the Ministry of Natural Resources is to provide opportunities for outdoor recreation and resource development for the continuous social and economic benefit of the people of Ontario, and to administer, protect and conserve public lands and waters.

Ontario
Ministry of
Natural
Resources

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EDITORIAL

Through space age eyes

Remote sensing, the subject of a major article in this issue of the Review, is the perception and study of objects from a distance. In practice, the term refers to the acquisition of data about conditions on the Earth's surface by means of sensors carried in aircraft or satellites, and the interpretation of the data to obtain useful information.

The most familiar type of remote sensing data is aerial photography. Other sensors carried in aircraft include thermal scanners, which record heat emanating from features in the scene beneath, and radar sensors, which can actively direct radar energy toward the Earth's surface.

The wavelengths involved in both thermal and radar sensing lie beyond the range of electromagnetic radiation that can be perceived by the human eye. The data recorded by the sensors is, nevertheless, translated into pictures known as *imagery*.

The era of civilian remote sensing satellites began in 1972 with the launch by NASA of the first Landsat satellite, designed exclusively for the study of Earth resources. Each Landsat has carried a scanner to detect and record visible light and invisible energy (non-thermal infra-red), in four different channels.

The development of techniques for acquiring data is one aspect of remote sensing. The application of the data to practical problems is another aspect. Ontario has gained national and international recognition in this field through a unique, advanced research body known as the Ontario Centre for Remote Sensing (OCRS).

The OCRS is a team of specialists in remote sensing from the disciplines of forestry, geology, geography, engineering and biology. The team is equipped with an advanced remote sensing interpretation laboratory, an airborne sensing capability, a comprehensive imagery library for Ontario, and an extensive collection of remote sensing literature. Established in 1973 within the Surveys and Mapping Branch, the Centre works in co-operation with any interested ministry, and with universities and private industry, to develop practical applications of remote sensing through research.

The OCRS has achieved some notable successes and begun the development of significant innovations. For example, the Centre is in the process of mapping the types of wetlands in the Hudson Bay—James Bay Lowlands. Thermal scanning has been employed for the detection of groundwater springs as possible sites for fish hatcheries. Within the field of wildlife management, the OCRS has applied airborne and spaceborne sensing primarily for habitat studies. In this issue of the Review, Dr. David Fraser of Wildlife Research Section discusses the role that remote sensing can play in wildlife management and research. ■

INTROSPECT

A personal opinion
not necessarily endorsed by
the Ministry of Natural Resources

Fishing—regulation or recreation

by Allan Wainio
Fisheries Branch

Going fishing isn't as simple as it used to be. Before the angler sets out for his chosen lake or river he begins to ask a multitude of questions.

Is the season open? Is there a sanctuary? How long is the sanctuary in effect? Can I use live bait? What's the catch limit? Is there a size limit? How many hooks can I use?

The questions go on and on and so do the regulations.

Fishing regulations are necessary to protect fish when spawning, to preserve endangered species, to prevent overharvest and to protect fish when they are especially vulnerable.

Furthermore, Ontario is vast, and the fishing laws are going to vary from north to south for the same species and even from east to west. That is unavoidable.

Nobody denies that we need regulations but in proposing detailed regulations for local waters, the broad provincial view is sometimes not considered. It is this parochial approach that can seriously affect management control.

Many cries for more fishing laws have come from the anglers themselves. There are brook trout enthusiasts, rainbow trout lovers, muskie fans—they all want special regulations to protect their favorite fish.

Fish sanctuaries are established to protect fish at certain vulnerable sites during their critical spawning period or during spawning runs. There are more than 220 sanctuaries in Ontario and each year more are added to the list. It may not be long before the province is so covered with a network of fish sanctuaries that anglers will be quite apprehensive about where they may fish.

Photo by Erika Thimm.

Sanctuary sign.

To top it all the laws are written in legal jargon, which adds to the anglers' exasperation.

Each year the demand for fishing increases. More than $2^1/_2$ million Ontario residents fish—about one-third of the population. To distribute a fair share of the fishery resource to all those anglers, management restrictions are necessary. But to what extent?

Idealistically of course, every lake and every stretch of river should be managed under different regulations, but such an arrangement in Ontario would be hopelessly impractical. We have about 250,000 lakes and unknown miles of rivers, more than any other political jurisdiction on this continent. It's understandable that with all this water and numerous fish species we should have many regulations. But should we increase the regulations until they become a burden?

Even if the regulations were based on townships and counties, the province would still be covered with a nightmarish

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Black bear with radio collar. Photo by G. Kolenosky.

Remote sensing in wildlife studies

by D. G. Fraser, Research Scientist
Agriculture Canada, Ottawa
Formerly with the Ontario Ministry of Natural Resources

WHEN I began doing zoological research in a cramped laboratory in Scotland, the work consisted mainly of watching animals at close quarters in a controlled environment. When I switched from mice to moose, I found myself in an entirely different kettle of vertebrates.

The first thing I received was a box of old data from a study on movement patterns of moose. Because few animals in the study had been seen by human beings more than two or three times, their movements had to be determined exclusively by remote means—through signals from a radio transmitter attached to the neck of each moose. Little of the study area had been seen from the ground by those conducting the project, so virtually all classification and mapping of habitat had to be done by the remote technique of black and white aerial photography.

This, for me, was an abrupt introduction to the fact that if an animal is secretive, or nocturnal, or wide-ranging, or lives in an inaccessible habitat, then its behavior and physiology can rarely be studied except by remote means. Equally, for extensive wildlife management on large tracts of land, remote techniques may be the only means to classify and map habitat.

Radio telemetry

For many types of wildlife, radio telemetry is clearly the most important type of

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From a paper presented by D. G. Fraser at the Remote Sensing Symposium, Toronto, Ontario, October 22-25, 1979, sponsored by the Ontario Ministry of Natural Resources and the Great Lakes Forest Research Centre under the auspices of the Canada-Ontario Joint Forestry Research Committee. COJFRC Symposium Proceedings O-P-8.

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remote sensing. Since its introduction around 1960, it has played a steadily increasing role in studies of wildlife from white-throated sparrows to grizzly bears.

Traditionally, radio telemetry has been used to determine the locations of animals in studies of behavior, timing of seasonal migrations, home range, dispersal and habitat selection. A typical example is our study of eight Ontario moose that were located at weekly intervals during most of a year.

There was little opportunity to study social interactions or relationships with predators. As was typical of the early studies, the technology was rather plodding; locating of animals was labor-intensive rather than automated; and the equipment was none too reliable.

An example of more advanced radio tracking comes from the Ministry's current research on the transmission of rabies in southern Ontario. This work has involved simultaneous tracking of red foxes, skunks, raccoons and coyotes. Nearly 200 animals have been studied, some by intensive tracking with locations determined every 15 to 30 minutes for several days at a time. The data is analysed by computer using specially designed programs.

The results have yielded many new insights into the ecology of the animals and the social relationships within and between species. Best of all, they also revealed the occasional long-range dispersal movements by which red foxes can carry the rabies virus from an outbreak centre to a largely uninfected area.

The tracking of polar bears posed an interesting problem because the bears travel for hundreds of kilometres in arctic seas where radio tracking by conventional light aircraft is not feasible. The development of transmitters that could be tracked by the Nimbus 6 satellite solved this problem. Movements of up to 1,300 km (807.8 mi.) have now been recorded for bears travelling between Alaska and northern U.S.S.R.

Equally exciting are the new automatic tracking systems, such as the one being developed at Grimsö, Sweden. In this system a central station sends a signal that activates an animal-borne transmitter. The reply signal from the animal is picked up at three receiving stations, the information is relayed to a central station, and the animal's location is calculated automatically by computer. The equipment is capable of recording location and physiological data on an animal every two minutes, with up to 60 animals being tracked simultaneously.

Some of the smallest developments are as valuable as the large ones. In the past, a typical radio collar for a black bear weighed half a kilogram, was laborious to construct, unpredictable in performance, and gave information on the animal's location only. This has been replaced by a collar half the weight, twice as reliable and that provides more information on the animal. This is made possible by improved batteries and components, including a printed circuit board, designed by J. Lotimer at Maple.

With an extra capital investment, thick film technology can be used to produce packages one-quarter to one-tenth the size for use on birds and small mammals.

All these examples have dealt with locating animals, but we are beginning to see many other applications of radio technology.

Radio equipment is now used to transmit data on the heart, body temperature and stomach pH of free-ranging animals for studies of bio-energetics and physiology. Alaskan workers have gathered some tradition-shattering information on the causes of death of moose calves by equipping animals with radios that enable biologists to determine when a calf has died. The signals from Lotimer's printed circuit board transmitter also tell whether an animal is active or resting, and this type of behavioral information could be refined substantially.

In addition to research applications, there are many potential uses of radio technology for routine fish and wildlife management. In fact, in California the commercial use of radio tracking is almost ancient history. Once research showed that radio-equipped dolphins could be used to locate beds of tuna, commercial tuna fishermen began to buy and use highly specialized radio-tracking equipment to lead them to promising fishing areas. The practice was widespread until it became illegal some years ago.

Radar

Radar is an important remote sensing tool in wildlife studies, particularly for work on migratory birds, bats and insects. Interest in this use of radar began during the Second World War when radar operators sometimes had difficulty distinguishing small aircraft from flocks of birds. Since then, radar has been used in the scientific study of bird migration in various parts of the world.

In 1969 a collision between a civil aircraft and a flock of snow geese near Winnipeg stimulated some applied research by the Canadian Wildlife Service. Initial work with radar led to the development of a weather-based system to determine the migratory bird hazard to aircraft. Current work involves prototype radar systems designed for use at airports to give immediate information on the bird hazard in the landing and takeoff area.

Thermal scanning

Thermal scanning showed early promise as a way to take a census of large animals from the air. Ideally the scanner should detect radiant energy from a warm animal against a cooler background, but there are many complicating factors.

Thermal scanning was originally developed as classified technology for military purposes, and as recently as 1968 a publication on a thermal census of white-tailed deer was permitted to include only an artist's impression of the imagery.

Since that time, restrictions have been relaxed on certain equipment, and a number of tests have been carried out. These indicate that thermal scanning has greatest potential for census of large animals on relatively flat terrain where there is little interference from a leafy canopy overhead. Even there, many complications from climate and vegetation remain to be studied.

Two recent reviews concluded that thermal scanning has limited potential for most wildlife census work, but perhaps this view is a trifle too gloomy. If we could only convince the military that the country is riddled with enemy agents cunningly disguised as moose and caribou, then we might suddenly find that there are effective tools for their detection.

Aerial photography

In wildlife studies, aerial photography remains the great workhorse for remote sensing of the environment, and it ranks with radio telemetry as a technique of first-order importance. In a recent survey of uses of remote sensing for wildlife, all but 10 of the 69 projects used aerial photography, most often for habitat evaluation.

In Ontario the major synthesis of aerial photograph information is the Forest Resource Inventory (FRI) mapping program, which concentrates heavily on merchantable timber. However, wildlife biologists generally want to know the height and species composition of deciduous undergrowth, types of wetlands, and the nature of ground cover and regeneration in logged or burned areas. Because it does not give this information, the FRI is not as valuable for wildlife purposes as it could be with some modification.

In addition to uses in habitat work, aerial photography has a variety of specialized applications in wildlife studies. Nesting pairs of lesser snow-geese have been counted by vertical aerial photography in the Canadian Arctic. The reproductive success of geese can be estimated from the ratio of adults to juveniles as recorded by oblique aerial photographs of birds on the ground or in the air. Aerial photography can be used to study the abundance of young in herds of caribou, bison and other mammals that live in relatively open habitat. Other applications include counting of beaver colonies and nesting gulls.

A particularly elegant example is the count of harp seal pups developed by D. M. Lavigne and his co-workers. Harp seal pups cannot be counted accurately through conventional aerial photography because their white coats do not show up against the white background of ice and snow.

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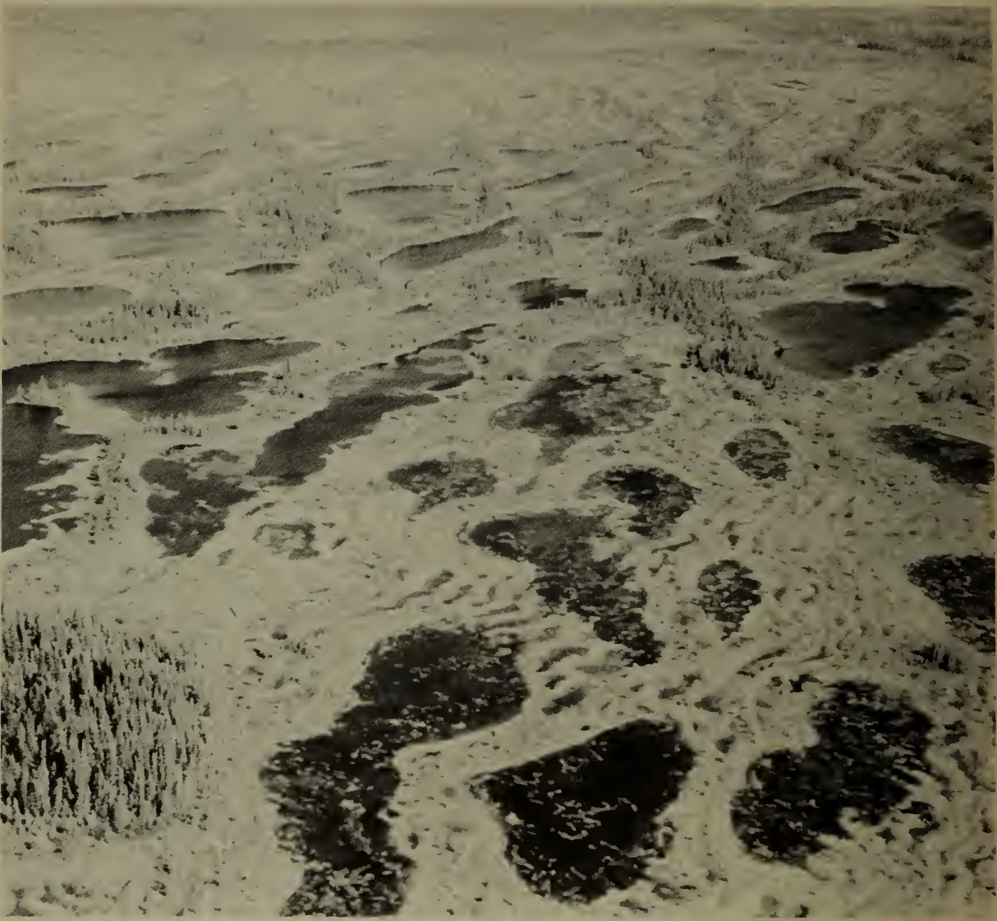

Photo by Simsek Pala.

Open pattern fen with ponds, in the Hudson Bay Lowlands.

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However, the white coats absorb a large amount of ultraviolet radiation, so through the use of ultraviolet photography, the pups can be counted and the population can be estimated accurately.

Satellite imagery and data

The land-scanning satellites provide a newer form of remote sensing. The application to wildlife studies has been limited, but much research is being devoted to the subject. Applications of Landsat information to wildlife work can be divided into two broad categories.

The first consists of simple discriminations made by the use of satellite data, usually over large areas where aerial photography or other means of gathering more refined information are not feasible. An excellent example is the annual monitoring of snow cover clearance from arctic goose nesting areas. The productivity of several species of geese is closely related to the date of snow clearance on the nesting areas. Satellite data can be used to detect unusually early or late disappearance of snow cover and, therefore, to predict high or low production. Other successful examples include simple vegetation typing over vast areas of grey kangaroo habitat in Australia, and identification of shallow arctic lakes which are potential breeding areas for Ross' geese.

The second category of Landsat application consists of more detailed vegetation mapping in smaller areas, usually as a cheaper alternative to aerial photography. For this type of work, Landsat information has been much less successful because of its limited resolution and inability to make certain important discriminations.

Poor resolution proved to be a problem in an evaluation of waterfowl habitat in the prairie pothole region. Many ponds important to waterfowl were too small to be detected by Landsat sensors, and the data had to be improved by correction factors derived by observation from aircraft.

The inability to make certain, important discriminations on the basis of spectral characteristics is mentioned repeatedly in wildlife studies using Landsat data. In an Alaskan study, alpine barrens and mountain shadow were confused with shallow water. In an attempt to estimate food available to lesser snow-geese on winter refuge, soya bean crops could not be distinguished from corn. Similarly, in a vegetation mapping program in Texas, heavily grazed grasslands could not be distinguished from urban areas, and marshes could not be distinguished from flooded rice fields.

In all these cases, the satellite data was still considered valuable, but it had to be used in conjunction with other types of information.

Recently a number of wildlife biologists have urged others to make much greater use of Landsat data, and in general this is good advice. With current technology, however, limited resolution and discrimination continue to pose problems. Any use of Landsat, particularly for habitat mapping, will have to include careful study to determine what information can and cannot be obtained by this means.

Conclusions

In future work on wildlife, we can expect to see continued and diversified use of radio telemetry, perhaps combined with other types of remote sensing so that an animal's movements and physiology can be interpreted in relation to habitat.

We can expect continued use of aerial photography, perhaps with greater emphasis on color infra-red techniques.

Radar and satellite data will be used for certain purposes, and a good deal of research will be carried out to identify the strengths and weaknesses of Landsat data for mapping habitat.

Two things stand in the way of increased use of remote sensing for wildlife.

The first is money. The Ontario government's wildlife research effort is not small by Canadian standards, but we are far from being able to afford equipment for automatic radio tracking as used in Sweden and France, even though this capital investment would give a much more cost-effective system than our present labor-intensive methods. Tracking animals by satellite telemetry is just as far beyond our financial grasp. Furthermore it is doubtful whether our wildlife managers could afford to use thermal scanning for routine wildlife census even if the technical problems were solved.

The second obstacle is the limited understanding between biologists and remote sensing specialists. In the early stages of wildlife radio tracking, there was some very poor communication between the biologists and radio engineers. Sidney Galler describes a preliminary meeting between the two groups. The biologists, ignorant of radio technology, produced a hopelessly elaborate set of requirements for a tracking system. The engineers, equally ignorant of the biological realities, designed a system that would need a woolly mammoth or brontosaurus to carry it, and a military budget to pay the bills.

That stage in wildlife telemetry is now long past. Many wildlife research workers, although leaving the gadgeteering to engineers, have a good grasp of radio technology, and the engineers show an impressive understanding of the biological uses of their handiwork. The biologist and engineer often work in the same laboratory or department, an example being the Wildlife Research Section in Ontario's Ministry of Natural Resources, which includes a radio engineer as one of the eleven permanent positions.

In the case of newer types of remote sensing, wildlife biologists are going through a similar process of development, but we are still at the stage of the woolly mammoth and brontosaurus. Impressive progress will not be made until a far greater level of communication and understanding is achieved between the biologist and the remote sensing specialist. ■

Photo by Dr. Donald Gunn.

A peregrine falcon in flight.

A very special moment

by D. Strickland
Algonquin Provincial Park Museum

IT has been my privilege over the years to have many memorable experiences in Algonquin Park but one of the most outstanding occurred in 1979, on a sunny, windy day in July.

Sitting on a high cliff in the park interior, I gazed out at the magnificent wildness of forest and lake, of hills and bogs, stretching out to the horizon. I was lost in the scene's immensity. Suddenly a shadow fell on my face and I looked up to see poised in mid-air, the unmistakable silhouette of an eastern peregrine falcon (*Falco peregrinus anatum*).

It had come out of nowhere and, seconds later, having satisfied its curiosity about the human intruder it zoomed along the cliff face and then shot straight up into the sky at breath-taking speed. Soon it was joined by another bird and for over an hour I watched as the two falcons put on a show I shall never forget.

There were dizzying barrel-rolls and high speed loops interspersed with lazy soarings and feather-light landings on wind-bent pines along the cliff brow. Throughout, the birds gave the impression of complete and effortless mastery of the sky and wind that I have not seen even remotely approached by any other bird.

It was a very special moment.

Something else contributed to the special nature of that day—the fact that the falcons were young birds raised to independence right there, not by adult falcons, but by human beings. Now, unless you know the story of the peregrine falcon, you may find this rather puzzling. You see, peregrine falcons have not nested naturally in Algonquin since 1962. Before that, they raised young on suitable cliffs here and there throughout the park and most of the rest of the world, but in the 1950s something went wrong.

First in Europe, and then in North America, peregrines started to disappear. Adult birds were laying thin-shelled eggs that cracked or otherwise failed to hatch and research soon showed that the trouble was caused by DDT picked up in the falcon's diet of smaller birds.

What was especially disastrous in the case of the peregrine was that with each prey item it consumed, the peregrine got the entire load of DDT that the prey had accumulated. Thus, in a very short time, the level of DDT (or its breakdown products) in a falcon's body could build up to the 10 to 20 parts per million that is sufficient to interfere with normal eggshell production.

Even more frightening was the realization that peregrines couldn't find safety in parks and other wilderness areas. In Algonquin, for example, it didn't matter that very little DDT was ever used. Not only did the falcons have to leave the park every winter for areas where DDT was used intensively, but also, back in the park during summer, they were eating birds that had picked up DDT outside Algonquin. That is why peregrines didn't last any longer here than they did anywhere else in eastern North America.

The prospect of seeing eastern peregrines again was remote—and still would be except for two things. First, Cornell University in the U.S. and the Canadian Wildlife Service obtained young peregrines from the last remaining population in the Rocky Mountains in the early 1970s. They undertook to keep the race alive by raising and breeding the young birds in captivity. Second, as a result of the drastic curtailment of DDT in 1969, there has been a slow decline of DDT levels in many of the prey species traditionally taken by peregrines.

Thus it became possible to attempt re-introductions of the peregrine to its former range. By taking young falcons hatched in captivity and raising them on cliffs used by peregrines in the past, we hope that the young birds will come to recognize those cliffs as ''home'' and eventually return to breed.

As one of several agencies joining in this project in Canada and the U.S., the Ontario Ministry of Natural Resources in 1977 chose one of the traditional nesting cliffs here in Algonquin and expanded the program to a second site in 1978. Including the birds put out in the summer of 1980, 36 young falcons have now been raised to independence on the two cliffs and all left the park at the end of August on their first southbound migrations. One of the 1979 birds was identified, through its band number, near Hamilton a few days after leaving the park.

At the time of writing, we did not have any definite returns to the park. This may seem discouraging but high first year losses are to be expected even in birds raised by their own parents, and breeding does not normally occur until the age of three in any case. We can take heart from experiences last year in Baltimore and New Jersey, where there were several partly successful breeding attempts by returning young falcons.

In 1980, our shipment of eight baby peregrines came in from Alberta on June 25 and they were flown into the park interior and installed in their cliff-top nest boxes the next day.

At the beginning of this account I described the time spent with the newly fledged falcons in the summer of 1979 as one of the most outstanding experiences I have ever had in Algonquin.

There is, however, something that will top even that. This will be the day when, through perseverence we finally see after more than 20 years, the first young peregrines to be raised by a re-established population of wild falcons.

That will be the most special moment of all. ■

Typical nesting habitat for peregrines.

Captive raised peregrines from Alberta.

Helping the peregrine fal

Placing a peregrine into its temporary home prior to release.

Young peregrines

return to Algonquin Park

Photos by Erika Thimm.

Lowering the young peregrines to their temporary nest box.

d outside on nest box ledge after release.

Young peregrine surveying its new domain.

"Halt! Conservation Officer!"

by K. Evans
Conservation Officer, Huronia District

THE spotlight snapped on again and swept the field in front of us, searching the night, stabbing into the darkness, causing eerie shadows to dance on the tree trunk inches from my face. I crouched even lower into the sparse cover along the road and shivered uncontrollably. I strained my eyes in the darkness, glancing over my shoulder to look for some expression of assurance from the still form of Tom Browning.

I depressed the transmit button on my two-way radio and whispered into the mike. I was sure the hoarse sound I produced and the muffled click from the radio could be heard miles away.

No response. The radios had worked perfectly, earlier in the evening, and I knew Paul Dreyer and Syd Small were only a few hundred yards away.

The light went out. In the comforting blackness that fell on us I tried to organize my racing thoughts. I knew that one of the persons approaching in the darkness was carrying a high-powered rifle. We had to get that gun to have enough evidence for a night hunting charge. We were in a potentially dangerous situation. We had to wait until the jacklighters were close enough for us to jump, but the surprise could cause a person's finger to jerk on the trigger of that rifle.

From past experience, I knew that the tendency of late night Nimrods when confronted is to drop everything and scatter. I hoped that this would happen now.

Just as my eyes were adjusting to the comforting blackness, my thoughts were again shattered by the searching beam, closer this time, and heading right for us. I could hear muffled voices now and the swish, swish as frost-hardened grass was trampled and pushed aside. I wished I had stayed behind that large maple ahead of us. Too late to move now—the beam would be on us any second. With a pounding in my ears, I huddled even further into the unyielding earth of the Minesing Swamp . . .

Every Conservation Officer in the province has probably been in the same dangerous situation in which we found ourselves that early morning of January 19, 1980.

The evening before, with Conservation Officers Paul Dreyer and Tom Browning, I had driven to Angus, near Barrie to meet fellow officer Syd Small. We then drove through light snow to the edge of Minesing Swamp, an area of overgrown apple orchards and open fields bordered by rows of oak, sumac and dogwood. Due to the unusually mild winter and lack of snow, deer were still roaming this area at night in search of food.

We hid our cruiser in an old building and pulled the door closed. Luckily, the light snow continued to fall long enough to cover our tracks. It was a dark, overcast night with the temperature below freezing. A light wind from the north made me wish I had worn a snowmobile suit instead of my uniform parka.

As most of the jacklighting in the area was done on foot, Paul and Syd walked west to watch a likely field while Tom and I went east. After two uneventful hours we decided to walk back to the cruiser for a warming cup of coffee. As we walked, a distant train whistle echoed over the swamp and was answered by a coyote to the north of us.

At ten o'clock, a vehicle, the first of the evening, rumbled past our location. It was an old half-ton with three occupants. We watched it pass, again glad of the light snow that covered our tracks. The vehicle stopped, turned around and came back. My imagination raced. Tom and I ran outside the building, clambered up a slight rise, watched the truck slowly turn a corner and disappear from view. No spotlight—must have been a dry run.

Paul and Syd returned. Two more hours went by. I heard the car radio crackle and

Ministry staff photo.

Conservation Officer Mike Thede checks the identification and the car of a hunter whose vehicle was parked at night in an area where deer poaching is prevalent.

Photo by W. Lanning.

Conservation Officer Ben Attard (Maple District Office) checking the catch of live minnows netted in the Credit River. Minnows are used as bait.

Ministry staff photo.

Aircraft are used by Conservation Officers to check anglers fishing on remote lakes. Each year Ontario tourist outfitters fly hundreds of anglers to these remote fishing areas.

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ran inside the building, stumbling in the darkness. I felt my way across the littered floor and slid in behind the wheel. It was Barrie OPP reporting the third road-killed deer of the night.

Shortly after midnight the glow of headlights again appeared in the west. We clambered up the hill for a better view. The vehicle slowly passed us.

The same truck! We've got something here. What should we do? Stop them and look for an unencased gun? Let them go in the likelihood it's another dry run?

The vehicle turned around in the same place as before and started back west. A spotlight from the passenger's window swept the field east of us.

We scrambled for cover as the spotlight played over the building containing our cruiser. I hoped that the closed door wouldn't arouse their suspicion. What to do? We watched the retreating tail-lights and the powerful spotlight as it swept the fields. Harried conversation. We waited. Nothing. We should have stopped them. They must have seen something and spooked.

Another hour passed. We were tired, cold and miserable.

At 2:30 a.m. we saw a flash of light over the trees west of us. We watched the searching beam for a while, then walked west toward the light, unconcerned about the tracks we were leaving in snow on the road. We reached an abandoned railway line and observed the spotlight 200 metres north of us.

''Looks like they're on foot.''

As we were discussing strategy the night was torn apart by a shot. My pulse began to race. Another shot! Paul and Syd decided to hide near the tracks in case the hunters returned the same way. Tom and I retraced our steps to the east in case they continued in that direction. I was glad we remembered to take the radios when we left the cruiser.

Tom and I reached a gap in the line of trees and decided to wait there. We could see a flashlight near the ground now, 200 metres northwest of us.

''They must be gutting the deer.''

Minutes passed.

''There's the spotlight again, moving across the field north of us. Looks like they aren't satisfied with one.

''They're coming our way! Down on the gound, find some cover!''

• • •

I tried the radio again, tucking my head inside my parka to muffle the sound. Nothing.

''Looks like we're on our own, Tom.''

Coiled and ready, we watched the deer poachers approach the gap.

Their spotlight beam reached us. We were up and running with flashlights on.

''Halt! Conservation Officer!''

No gunshot, just retreating shadows. Who's got the gun?

I grabbed a body, scuffled, held on.

''Conservation Officer. You're under arrest.''

Paul and Syd appeared out of nowhere and raced by me, following Tom's running figure down the field. Tom and Paul returned a few moments later escorting a handcuffed suspect. What have we got? A spotlight, two suspects with deer hair and blood on their hands and pants—but no gun. Neither of them responded to our accusations. One of the men had a previous conviction for night hunting. We found three sets of tracks—we had missed a poacher.

Paul and I searched the field to find the deer. It had to be there somewhere. Finally, Paul called from the edge of the field 100 metres away. I ran to him. He was standing over a nine-point buck, gutted and still steaming. It was shot once in the back and once in the head.

Paul and I walked back to the cruiser and drove to where Tom and Syd were still holding the two poachers. Into the cruiser. More questions. No response.

''You're only shooting the big bucks these days, eh?''

''It's got a good rack, eh? I don't like shooting this time of year.''

Good evidence.

Tom and Paul continued to track the missing party. They found a loaded .243 calibre bolt action rifle where the panicked poacher had ditched it.

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Bats in the belfry

by Harold Jenkins
Wildlife Information Officer,
Wildlife Branch

Photo by William Carrick.

Little brown bat.

THE most common bat in Ontario is the little brown bat (*Myotis lucifugus*), which spends the winter months in caves. When spring arrives the animals leave the caves in which they have been hibernating. During the warmer part of the year the males live either singly or in small groups, resting during the daylight hours behind slabs of tree bark, or in some other natural cover. Females, on the other hand, look for large, dark, warm, enclosed spaces in which to form colonies for the birth and rearing of their young. How considerate of house builders to have provided attics; from the bats' point of view almost ideal locations for summer colonies!

Homeowners are not too enthusiastic about having bats share their homes. No doubt this has something to do with the pungent odor discernible on those warm summer days. Or perhaps it has something to do with the sudden appearance of an uninvited winged visitor in the dining room when great aunt Maude and cousin Flo are visiting from Winnipeg. A more serious problem is that bats are known to carry rabies.

Furthermore, large numbers of dead bats in an attic will lower property values even more than the aroma of their droppings! Bats are in fact valuable animals from a human standpoint in that they eat large numbers of flying insects, such as mosquitoes, every summer. Destroying them, then, is unwise from an ecological perspective. The question is how to encourage the wee things to take up residence in some more suitable (from our point of view) location. The answer? Mothballs!

In an attic full of bats mothballs can be most effective. During the morning, mothballs should be spread liberally over the attic floor. Extreme care should be taken to keep this substance out of the reach of children, and hands should be thoroughly washed after placing the naphthalene in the attic. Some bats may begin to leave almost immediately as the offensive smell permeates their erstwhile summer home, but there will be many hangers-on until dusk. The treatment should be repeated on the second day, to ensure that bats tempted to return are firmly convinced that there must be happier hang-outs elsewhere.

Prior to the mothball treatment, the homeowner should determine the hole(s) on the outside of the house through which the bats gained access to the attic in the first place. This can be done on any evening by watching for signs of bats leaving for their night hunting. This is necessary because the access hole(s) must be plugged when the mothballs have done their work. After the mothballs have evaporated, the bats will almost certainly return if there is still a means of access because they find the odor of their droppings very attractive. This is why the same caves and summer roosts are used year after year. If all holes are plugged, however, they will have to find another summer residence. ■

INTROSPECT

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set of rules that few would attempt to unravel. Tourists would forget about trying to do any fishing and even the locals would begin to wonder what went wrong.

Before asking for another regulation we should all ask ourselves: ''Do we really need it? Can it be enforced?''

Fishing is such a simple, wholesome, outdoor pursuit we must take care not to destroy it as a pleasant pastime in our passion to protect the resource. ■

Tick talk

by E. M. Addison,
Scientist, Wildlife Research Section, Maple

WE occasionally see ticks on deer, rabbits, hares, beaver and other furbearers. It is unusual to find more than 100 ectoparasites (external parasites) on one animal but moose can be infested with large numbers of ticks. Only one species of tick, *Dermacentor albipictus*, is commonly found on moose.

Dermacentor albipictus is often called the winter tick, a name it comes by honestly. During the 1960s Dr. Audrey Fyvie of our research group and Fred Johnson of Chapleau examined moose from the Chapleau Crown Game Preserve each month of the year. No ticks were present during the summer. The first tick was seen in late September and the numbers of ticks then increased until late autumn.

The ticks remained on the moose during the winter, but by late April and May they were dropping off.

Although the winter tick has been known for more than 100 years, it is seldom seen since moose are not handled frequently in winter.

While on moose, ticks take several meals of blood. They shed their cuticle twice, increasing in size and developing to adults from small larvae the size of a pin-head. The adult females can be almost the size of a thimble. When mated they take large quantities of blood as a source of energy for production of eggs.

Once the ticks have dropped from the moose the females lay their eggs under leaves and twigs on the ground. An individual winter tick may lay more than 7,000 eggs. The eggs hatch during the summer about one month after they are laid. The larvae that emerge remain dormant during the summer months.

The shorter days and colder weather of autumn probably stimulate the small larvae to crawl up grass and shrubs and wait to be brushed by passing moose.

We suspect that some larval ticks that do not get on moose one year may survive and be available for infection the following year.

Two objectives of the tick study in the Chapleau area were to determine how many ticks were present on moose and if the ticks were adversely affecting the health of the moose.

The hides were shipped to Maple where we initially sorted by hand through the long hair in search of ticks. We were soon using a new technique, which allowed us to dissolve all the hair from the hide, and then filter the ticks out of solution with a sieve.

We were startled to find a number of moose with more than 5,000 ticks. From the most heavily infested moose we recovered 13,490 ticks! These numbers were far in excess of what we expected. Perhaps even more surprising was that the most heavily infested moose all appeared to be in excellent condition.

In contrast, we had previous reports of large numbers of dead moose during late winter and early spring, that were heavily infested with ticks. In one case, in the spring of 1956, a trapper near Matheson, Ontario found 37 dead moose with ticks on them. Although these reports did not prove that ticks kill moose, they did arouse suspicion.

In the spring of 1975, two forest workers in the Algonquin District noticed an unhealthy moose lying in the snow. After it remained in the same position for one or two more days, it was sacrificed and picked up by conservation officers John Brisbane and Alex Terry.

They found that most of the moose hide was without hair. Scabs and open deep sores in the skin were present in many of the bare patches. Winter ticks were present in the remaining patches of hair.

The animal was very thin, having used up all of its fat reserves. Ticks appeared to be the only potential cause of sickness.

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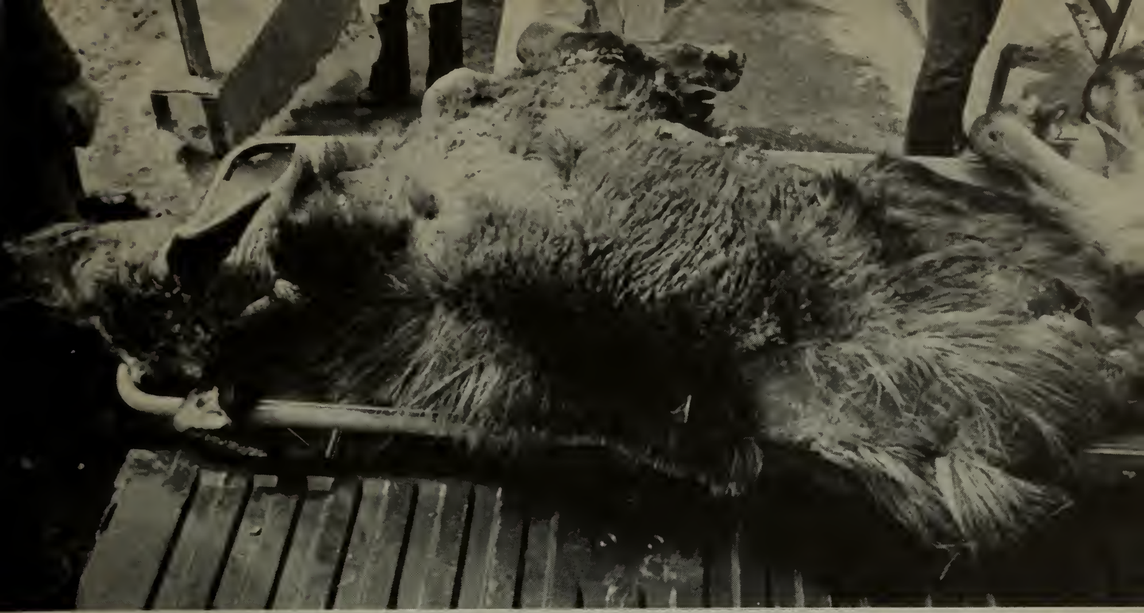

A dead moose from Algonquin Park. Note the loss of hair. Photo by Dennis R. Voigt.

A dead moose in the Alfred Bog. It had 83,000 ticks on it. Photo by Brian Steele.

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It is not known how many winter ticks are required to adversely affect a moose or exactly how they affect moose. Moose have been observed rubbing against trees and rocks until they rub off their hair. The rubbing may be associated with irritation from the mouth parts of the ticks embedded in the hide.

The loss of hair decreases the moose's insulation in winter, which in turn results in more rapid loss of body heat. The increased heat loss and loss of blood may be the two most important factors contributing to the poor health of heavily infested moose.

In the early months of 1979 a number of moose were found dead in the Alfred Bog area of Cornwall District. The Alfred Bog moose herd is unique in that it is in an agricultural area of southeastern Ontario (see *Ontario Fish and Wildlife Review*, Vol. 18, No. 2). An investigation was organized by Dave Watton, regional biologist, Eastern Region and Bill Lannin, fish and wildlife supervisor, Cornwall District. Dave, Bill and I, with conservation officers Bert van Wout, Brian Steele, Eric Johnston, Ron Sprigings and Barry Walker from Cornwall District, met at the edge of the bog on the morning of March 15. Five dead moose were located by helicopter and then hauled from the bog by snowmobiles and sleds.

From our investigations the following day we found that the moose were generally very thin although they had lots of browse in their rumens. One cow had eye problems, and a bull had pleurisy and heavily congested lungs (possibly pneumonia). Another cow had lost the hair from about three quarters of its body and had badly congested lungs. The cow moose with little hair had some winter ticks, but very few compared to the other four moose.

Hides of the four moose with lots of hair were bagged and taken to Maple. The hides were dissolved and ticks were collected in a sieve.

We were astonished by what we found. An eight or nine-year-old cow in poor condition had approximately 16,000 ticks, a six or seven-year-old cow had 31,000 ticks, the emaciated three or four-year-old bull had about 83,000 ticks, and the only calf in the group had about 86,000 ticks!

The excessive numbers of ticks probably contributed to the death of the Alfred Bog moose. We are not sure how important they were since it is not know how many ticks a moose must carry under different range and weather conditions before its health is affected.

We do know ticks were probably only one of the factors that led to the demise of the moose. Others could be the possible harassment of the moose by snowmobilers and the unusually bitter cold weather early in 1979.

An additional problem may have been the relatively high density of moose in the Alfred Bog. At present we have not identified reasons for an association between high densities of moose and excessive winter tick infestations but have recognized that the high densities of moose and ticks appear to go ''hand in hand.''

There are a lot of unanswered questions about winter ticks on moose. How can moose seem to tolerate such large numbers of ticks relative to other species of wildlife! What factors influence the large increases in ticks on moose during some years, but not others?

With our growing knowledge and interest we may eventually be able to predict when and where moose will experience tick problems and possibly be able to take steps to minimize the torment to and losses of moose. A research program began in 1980 to answer some of the above questions. ■

"Halt! Conservation Officer!"

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We loaded the deer as the eastern sky was turning red, and headed for Angus. When the seizures were tagged and stored we left the office for home. It was 7:00 a.m. and Alliston residents were beginning to stir, oblivious to our all-night vigil.

The two accused pleaded guilty to charges of unlawfully hunting deer and unlawfully hunting at night. They were convicted and fined $887. The rifle, spotlight and deer were permanently confiscated. ■

Plaster casts of animal tracks. Photo by R. Gray.

To make an impression

by G. R. Harris
Special Programs Officer, Owen Sound District

DURING the past three years there have been numerous reports of a large cat in the Owen Sound District. Descriptions varied from seven feet long and four feet high with a five-foot tail, to three feet long and two feet high with a seven-foot tail—in various colors!

To identify this creature, impressions were made of paw prints purportedly left at the sighting locations. To date they had almost always proven to be canine but one from a chicken yard was identified as a cat track about the size of a lynx track.

Duplications of the imprints of vehicles, animals and men are often used in law enforcement investigations. This technique has even been used to help track such weird and wonderful creatures as the Sasquatch.

Impressions at one time were made with plaster of paris and it required great care and effort to produce even a reasonably good facsimile. However, in recent years it has been replaced with new products that make reproduction of prints a quick and easy process.

To duplicate tracks made in mud, sand, snow or ice, a plaster-like cellulose filler is mixed with water to a paste just thin enough to sink into all crevices including toe-nail marks. The time required for setting varies with the moisture content of the track and the amount of water used in the mix.

When the filler is well set the mat cast can be lifted from the original track and removed to a warm room for cleaning with a soft brush.

To make an exact replica of the original track, a thicker mixture of filler is put in an aluminum pie plate of adequate size and allowed to harden until it is approximately the same consistency as the mud or other

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Photo by Erika Thimm.

Interesting conversation pieces can be made with plaster impressions of ancient fossils, such as these found in an Ontario gravel pit.

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material from the original imprint. The track mat is then placed in the firm mix and pushed down even with the surface. In 10 to 15 minutes, when the mix is almost hard enough to remove in one piece, the track mat is removed and behold, an exact copy of the original print is in hand, ready for an expert's identification.

The track mat can be easily broken when removing it from the completed replica when the plaster-like filler is used for both casts. Better results are obtained by using Jeltrate to make the original impression of the track. This is a product dentists use to make impressions because it remains quite flexible. It can be removed undamaged from the hardened plaster-like filler with very little effort and can be handled and stored without breaking. Another advantage of Jeltrate is the short setting time, which can be a matter of seconds if warm water is used in the mixture.

For future reference, location, date and time should be inscribed in the finished cast with a sharp point just before final hardening.

Casts of bird tracks such as great blue heron, Canada goose and wild turkey are most intriguing and make good conversation pieces for office or den. Good fossil impressions can also be taken by this method, instead of chipping the fossils out of rocks in our provincial parks. ■

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Ontario
Conservation
Officer